IN THE UNITED STATES DISTRICT COURT FOR THE
NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA,

Plaintiff,

vs.

TYSON FOODS, INC., et al,

Defendants.

No. 4:05-CV-00329-TCK-SAJ

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VOLUME II VIDEOTAPED DEPOSITION OF JOHN PATRICK CONNOLLY, produced as a witness on behalf of the State, in the above styled and numbered cause, taken on the 9th day of April, 2009, in the City of Tulsa, County of Tulsa, State of Oklahoma, before me, Marlene Percefull, Certified Shorthand Reporter, duly certified under and by virtue of the laws of the State of Oklahoma.

EXHIBIT
A

A Yes. 10:26AM

Q So you've seen the data but you haven't seen it represented in this format, correct?

A Correct.

Q Okay. Are any of the years we have phosphorus data, which is on Page 14 of Figure 7, does lake one, which is the lacustrine and lake two, which is the lacustrine area, come to an average summer mean phosphorus of eight -- let's not look at the phosphorus, excuse me. Chlorophyll-a. Look at chlorophyll-a. It's on Page 2. For Lake 1 and 2, the lacustrine areas, do you see any time period where it's at eight? 10:27AM 10:27AM

A No.

Q Let's hold that for a second, go back to my other. When you make this statement in 224, on Page 224 of your report, that there's similar water quality, what are you evaluating in terms of water quality when you compared these reservoirs? I think it was Hugo and Sardis to Tenkiller? 10:27AM 10:28AM

A Chlorophyll levels, phosphorus levels, and dissolved oxygen profiles.

Q Okay. Do you know Dr. Cooke?

A Not personally.

Q Do you know his reputation? 10:28AM

A Yes. 10:28AM
Q What is his reputation?
A His reputation is as a quality limnologist.
Q What about Dr. Welch?
A I don't know Dr. Welch. 10:28AM
Q Do you know his reputation?
A No, not as much.
Q Do you know Dr. Jack Jones at the University of Missouri?
A No. 10:28AM
Q Do you know of his reputation?
A No.
Q On Page 224, it appears that you actually did form a hypothesis for this section as opposed to 2-7, is that correct? 10:29AM
A Yes.
Q Okay. What is your hypothesis that you want to test in this section?
A That in the absence of poultry litter there would be minimal or no water quality issues. 10:29AM
Q Okay. And how did you test the hypothesis? Do you want to read from your report? You don't have to.
A We tried to find other lakes that we could compare to Tenkiller that had similar water quality to determine whether, in fact, they had poultry litter to 10:29AM

test the hypothesis that in order to have such water quality would require poultry litter, all other things being equal. 10:29AM

Q And you selected which two lakes or reservoirs?

A Lake Hugo and Sardis. 10:30AM

Q Okay. And what were your criteria for selection of Hugo and Sardis?

A The first criteria were reservoirs that had similar water quality.

Q Okay. 10:30AM

A The second criteria was reservoirs that had similar land use patterns in the watershed.

Q Okay.

A The third criteria was to get as close to similar eco-region as we could. And the fourth criteria was to 10:30AM try to get systems that had similar lake surface area to watershed area.

Q Any other criteria?

A I'm sure there were others. Those are the ones that come to mind. 10:30AM

Q I guess one of the criteria might have been whether or not they had poultry in the watershed or not, land use?

A Yes, yes, of course.

Q Did you determine whether or not Hugo and Sardis 10:31AM

watersheds had few poultry operations? 10:31AM
A We determined they had very few poultry operations.
Q How did you determine that?
A We, as I recall, worked with Dr. Sullivan in trying to determine poultry house density from aerial photography. 10:31AM
Q Do you have any reference or information in your report that supports your conclusion that they had few poultry operations? 10:31AM
A I have not checked. As it indicates here, I may have misspoken.
Q Can you tell us where you're referring to, Doctor?
A I'm sorry. Table 29, there's a footnote.
Q 29, okay. 10:31AM
A Poultry, cattle and swine animal units acquired from personal communications with Wally Jobes.
Q Who is Wally Jobes?
A I don't recall. I would have to check.
Q So if Wally Jobes is wrong then the analysis would have that flaw? 10:32AM
A Yes.
Q Okay. Do you know, did you check to see if there's any wastewater treatment plant discharge in either Hugo or Sardis watersheds? 10:32AM

A We reviewed the EPA database to see whether there were permits for discharge in the watershed. 10:32AM

Q And were there?

A Nothing of any consequence, no.

Q Were there wastewater treatment plant discharges in the Hugo and Sardis watersheds? 10:32AM

A I don't recall now whether there were any at all. We certainly concluded that they were not of consequence, but I'm not recalling whether that meant that it was zero. 10:33AM

Q What was your basis for lack of little consequence?

A Design flow.

Q And do you have any documentation of that here in your report? 10:33AM

A No, that would be in considered materials.

Q Did you determine whether or not there were any permitted CAFOs? Do you know what a CAFO is?

A No.

Q Combined animal feeding operations in watersheds? 10:33AM

A I don't recall.

Q Do you know whether Mr. Jobes determined whether or not there was any permitted CAFOs in those watersheds?

A I do not. 10:33AM

Q Let me hand you what's marked as Exhibit 15. 10:34AM

Do you see the source of this information down here in the left, sir? Sources land use, national land code, database. Are you familiar with that source, sir? 10:35AM

A Yes, I am.

Q Are you familiar with Oklahoma Department of Agriculture, Food and Forestry?

A Yes, sir.

Q And USEPA for wastewater requirements? 10:35AM

A Yes.

Q Okay. Can you identify, sir, how many CAFOs there are in the Sardis watershed on Exhibit 15?

A Some of these are overlapping, so probably I can not. 10:36AM

Q Okay. But looks like there's maybe about an eight to ten?

A Something on that order.

Q And what about in the Hugo watershed?

A Maybe another ten. 10:36AM

Q Okay. And are there other POTWs within the Hugo watershed?

A This is a little bit like Where's Waldo.

Q We've got some marks on here. They've tried to label them. 10:36AM

A Okay. 10:36AM
Q But I admit it's hard to find the dashes there in all the information.
A Yes.
Q Okay. How many are there within the Hugo watershed? 10:36AM
A Appears there are three.
Q What are the discharges of phosphorus from those public works authorities, do you know?
A I do not. 10:37AM
Q Did you evaluate that when you did your analysis?
A One of the staff working for me did.
Q Okay. And are those results reflected anywhere in your report?
A No, sir. 10:37AM
Q Do you know whether Mr. Jobes used the information, Mr. Jobes, Wally Jobes, that you referenced there, used the information seen on Page 2 of this report on a number of animals in CAFOs as reported by the Oklahoma Department Agriculture? 10:37AM
A I would have to check. I don't know.
Q Do you have any report from Mr. Jobes in your considered materials or was it just simply a verbal conversation where he gave you the data in Table 2-9?
A I don't know. 10:38AM

Q Says "personal communication." Was that your personal communication or someone else's? 10:38AM

A Someone else's personal communication.

Q Dr. Connolly, when you did your analysis of your hypothesis comparing these reservoirs, was it important that you compared reservoirs that had similar characteristics? 10:38AM

A Yes.

Q How about the characteristics of a reservoir impact water quality of a reservoir? 10:38AM

A In numerous ways. The size of reservoir in comparison to the watershed is important because it determines the amount of land contributing to the reservoir relative to the size of the reservoir. The residence time of the reservoir is important, how long water stays in the reservoir, the depth of the reservoir as well is important. 10:39AM

Q Is it reasonable then using some of the criteria you mentioned to compare trophic states of deep thermally stratified reservoirs with shallow, unstratified reservoirs? 10:39AM

A Can you repeat that question, the front part of it?

(Whereupon, the court reporter read back the previous question.) 10:40AM

Q Let me repeat the question. Is it reasonable to compare the trophic states of deep thermally stratified reservoirs with shallow unstratified reservoirs? 10:40AM

A Yes, so long as you keep that difference in mind as you're doing the comparison and with the implication of what that difference might be. 10:40AM

Q What is the implication of that difference?

A The implication of that difference is whether or not in the stratified reservoir you have a source of phosphorus from the sediments that may be important to the water quality of that reservoir. 10:40AM

Q So in an unstratified reservoir there could be an additional source of phosphorus to the epilimnion that's not present during the summer months of a stratified reservoir, correct? 10:41AM

A No.

Q So what do you mean by that? I don't understand. Wouldn't an unstratified reservoir have an additional source of phosphorus from sediments that is not present in the epilimnion of the stratified reservoir? 10:41AM

MR. TODD: Object to form.

A Not of consequence.

Q And how did you make that determination?

A In order to have a significant source of phosphorus from the sediments you have to drive the 10:41AM

water column to near zero or zero dissolved oxygen. 10:41AM

Q Don't sediments release oxygen when they're oxidized also?

A I don't understand what you just said.

Q Are you saying that the only time sediments contribute oxygen to lakes is when they're anoxic -- excuse me. The only time that sediments contribute phosphorus to lakes is when they're anoxic? 10:42AM

A The only time they contribute substantive amounts of phosphorus is when they're anoxic. 10:42AM

Q And what's your basis for that statement?

A That's a well known concept that a limnologist or engineer working on reservoirs understands. It's in every textbook.

Q What about shallow lakes? 10:42AM

A What do you mean "what about shallow lakes"?

Q Would you expect sediments to contribute phosphorus to the waters of shallow reservoirs to a greater degree than deep reservoirs?

A I think I've answered that, that not unless they were going anoxic. 10:43AM

Q Okay. Would you expect a shallow reservoir to respond the same way to watershed events as a deep reservoir?

A Not necessarily. 10:43AM

Q Did you consider when you did your evaluation in 2.8, the depths, temperature profiles, and phosphorus loadings of the three different systems? 10:43AM

MR. TODD: Object to form.

A We did no quantitative analysis of phosphorus loadings. We used land use as a surrogate as a potential for loadings, but we did consider those other factors, yes. 10:44AM

Q Did you consider depths?

A Yes. 10:44AM

Q And temperature profiles?

A Yes.

Q But you don't consider loading?

MR. TODD: Object to form, mischaracterizes.

A We considered loading in terms of land use characteristics, but made no quantitative assessment of loading. 10:44AM

Q Well, you didn't actually determine whether the loading, the actual loading in Tenkiller were comparable or not to the loading in Sardis and Hugo, correct, the actual phosphorus loadings? 10:44AM

A We did not do a quantitative calculation of loadings.

Q Okay. You didn't calculate how much phosphorus was going into Sardis or Hugo, correct? 10:44AM

A Correct. 10:44AM
Q Is that information available?
A Not as far as I know.
Q Did you look for it?
A Yes. 10:45AM
Q Did you look for it from USGS studies?
A I believe so.
Q And did you find any?
A I would have to go back and check.
Q Let's look at Table 2.8. This is a comparison of 10:45AM watershed characteristics, correct?
A Yes, it is.
Q Okay. In Tenkiller, what is the ratio of watershed area and lake volume?
A Watershed area and lake volume? 10:45AM
Q Yeah. What is the relative -- you have watershed area there, 1,052,800 acres?
A Yes.
Q And the storage acre feed pool?
A Mm-hmm. 10:46AM
Q Okay. What is the ratio between those two?
A About 1.7, 1.8 to one.
Q And how is that compared to Lake Hugo in the same reservoir?
A Lake Hugo is probably seven or eight to one. 10:46AM

Q So are they comparable with that metric, that is, Tenkiller to Hugo? 10:46AM

A No.

Q So Hugo has a lot smaller water volume with approximately equivalent same size of watershed? 10:46AM

A Yes.

Q Wouldn't that size of lake volume have a -- difference in lake volume have an impact on the water quality of the lake when you're trying to compare it to Tenkiller? 10:46AM

A Probably not significant.

Q And what's your basis for that?

A If you turn to Table 2.10.

Q Mm-hmm.

A And you look at residence time, how long water remains in the lake, for Hugo the residence time is 1.3 months, which is considerably shorter than Tenkiller, which is 8.8 months. But 1.3 months is sufficient time to allow settling, so that the difference in these volumes here is significant only in the sense of whether or not we can settle out material or whether that material remains in the water column. A 1.3 month residence time is sufficient to settle material out. 10:47AM 10:47AM

Q Not as much settling as you would find in Lake Tenkiller, correct? 10:48AM

A Probably not that much different. 10:48AM

Q Are you really suggesting there's not that much difference in settling between Tenkiller and Hugo when you have an 8.8 versus a 1.3 residence time?

MR. TODD: Object to form. 10:48AM

Q Is that your testimony, sir?

A Yes, it is.

Q And did you do any analysis to justify that opinion?

A Analysis wasn't necessary. 10:48AM

Q What does watershed area to lake volume tell you about the reservoir?

A Tells you something about the likely residence time.

Q Okay. Does it tell you anything about dilution of 10:48AM the water?

A Not a lot.

Q It doesn't?

A No.

Q Wouldn't you expect a reservoir with a shorter 10:49AM residence time to have more dilution by inflow to the lake?

A No.

Q Doesn't the residence time of Hugo indicate that Hugo is highly flushed by the inflow? That is, it has 10:49AM

1.3 versus 8.8 residence time? 10:49AM

A Yes.

Q And much more flush than Tenkiller, correct?

A Yes.

Q So the hydrology of Hugo is different than Tenkiller, is it not? 10:49AM

A Yes.

Q Okay. Now, let's look at Sardis Reservoir. How does the watershed size of Sardis compare to Tenkiller?

A It's about seven or eight times more. 10:50AM

Q About 15 percent?

A Mm-hmm.

Q Wouldn't this have an impact on the -- the effect of Tenkiller versus Sardis on the water quality in the two reservoirs? 10:50AM

A Yes.

Q So that makes them not quite as comparable, correct?

A It makes them different but as long as you keep those differences in consideration, you can still make comparisons. 10:50AM

Q How does the volume of Sardis as a storage volume compare to Tenkiller?

A It's about 35, 40 percent of Tenkiller.

Q So that's another significant difference, is it 10:50AM

not? 10:50AM

A Yes.

Q I think you mentioned earlier you're familiar with the Vollenweider model to predict concentrations in lakes and reservoirs? 10:51AM

A Mm-hmm.

Q Can you tell us what that is?

A Not off the top of my head.

Q Did you perform that analysis on these three reservoirs to determine whether there would be any effect of the hydrology and characteristics on phosphorus concentrations? 10:51AM

A No.

Q Okay. Let me hand you what has been marked as Exhibit 16. This is a document that we've prepared -- 10:51AM

MR. TODD: Go off the record real quickly.

THE VIDEOGRAPHER: We're now off the record. The time is 10:51 a.m.

(Whereupon, a discussion was held off the record.) 10:52AM

THE VIDEOGRAPHER: We are back on the record. The time is 10:52 a.m.

Q Dr. Connolly, I've handed you Exhibit 16 where it shows the -- a model, a simple Vollenweider model of Tenkiller to Sardis, doesn't it? 10:52AM

Q And would that be affected by the hydrology and morphology of the different reservoirs? 10:56AM

A Yes, it would.

Q Doesn't -- if this is correct, doesn't this model indicate that it's difficult to discern relative impacts of poultry in these three different reservoirs? 10:56AM

A I can't say one way or the other based on this.

Q Let me ask you another question then. If these three different water bodies, Tenkiller, Hugo and Sardis, were similar or identical, wouldn't they model identically or nearly so if they were loaded with the same phosphorus concentrations? 10:57AM

A Not necessarily.

Q Well, how would you account for the changes then?

A Account for the changes? I'm not sure what your -- 10:57AM

Q In phosphorus concentrations, if they're not different, if this model doesn't show that these reservoirs are not functioning differently, for example, we looked at residence time a few minutes ago. 10:57AM

A Yes.

Q And Hugo's residence time is a lot different than Tenkiller's, correct?

A Yes.

Q And we see a difference in phosphorus 10:58AM

Q That's another difference between Tenkiller and Lake Hugo and Sardis? 11:02AM

A Yes.

Q How can a riverine zone have an impact on reservoir processes? 11:02AM

A On what processes?

Q On processes that occur in a reservoir, what's the impact of riverine zone on, let's say, eutrophication processes in a reservoir?

A It's very site specific, so it's hard to make a general statement about riverine zones. 11:02AM

Q Well, you seem to have made a notation here about Hugo and Tenkiller having a different type of riverine zones?

A Mm-hmm. 11:03AM

Q And Sardis and Tenkiller being different also in that regard, correct?

A Yes.

Q Okay. So what does that difference -- does that difference have any impact on reservoir processes? 11:03AM That is the fact that Tenkiller has a long riverine zone and Sardis and Hugo do not, does that have any impact on reservoir processes? Let me say it another way. Does the lack of riverine zone in Hugo and Sardis change their processes and make them distinct from some 11:03AM

of the processes that are occurring in Tenkiller? 11:03AM
A Potentially.
Q And what processes would it affect?
A Where phytoplankton growth may occur in the reservoir. 11:04AM
Q And does it have any effect on the hydrology of the reservoirs? Could it have an effect in that regard?
A I suppose but nothing specific that I can think of. 11:04AM
Q Wouldn't a riverine, long riverine zone tend to retard the inflow waters into the reservoir so that the movement could be slower, have an effect on kinetics in that regard?
A The movement of the water -- 11:04AM
Q Would be slower in the reservoir?
A Where?
Q Within the reservoir.
A Not necessarily.
Q Would sedimentation processes be affected? 11:04AM
A Perhaps.
Q And how would they be affected?
A There may perhaps be less sedimentation in the upper portions of a reservoir with the riverine section than one without. 11:05AM

Q Did you determine whether these potential differences were, in fact, differences between Sardis, Tenkiller and Hugo? 11:05AM

A No.

Q Do scouring -- do you know what scouring is when we talk about scouring effects on a reservoir? 11:05AM

A Yes.

Q What is that?

A Scouring is the erosion of sediments from the bottom of the reservoir. 11:05AM

Q Do scouring effects occur in a riverine zone of a reservoir?

A It would depend upon the reservoir.

Q Did you determine whether that's going on or not in Tenkiller? 11:05AM

A No.

Q If it was, could that have a big -- indicate another difference between Hugo and Sardis on the one hand and Tenkiller on the other?

A Perhaps. 11:06AM

Q Does scouring influence the delivery of water to the reservoir?

A No.

Q Does scouring influence the delivery of nutrients down the reservoir? 11:06AM

A Perhaps. 11:06AM

Q And can scouring have an effect on turbidity in downstream portions of the reservoir?

A Perhaps.

Q And how does that occur? 11:06AM

A By eroding material off the bottom creating turbidity in the water and carrying that turbidity downstream.

Q Does the lack of the riverine zone detract from the utility of Hugo and Sardis in comparison with 11:06AM Tenkiller?

A To some extent.

Q Is the potential for internal return of nutrients from sediments greater in Sardis and Hugo reservoirs than they are in Tenkiller? 11:07AM

A No, not necessarily.

Q What's your basis for that statement?

A Well, all three reservoirs are subject to oxygen depletion in anoxic bottom waters. The shallow reservoirs will not set up as strong a stratification, 11:08AM whereas, long stratification as in a deeper reservoir. So that may have some influence on their ability to recycle phosphorus. And so, if anything, there perhaps would be slightly less recycle from the sediments than Hugo and Sardis, but I would have to go through a much 11:08AM

report, sir? 11:33AM

A Yes.

Q Okay. What are the average depths of Tenkiller, Hugo and Sardis?

A Hugo is 11.9 feet, Sardis is 20.2 feet and Tenkiller 50.7 feet. 11:33AM

Q So Hugo is about four times shallower than Tenkiller?

A Yes.

Q And Sardis is about two and a half times shallower? 11:33AM

A Yes.

Q Okay. Can these differences in average depth have an impact on water quality, all the things being equal?

A Yes. 11:33AM

Q Did you consider those differences when you did your analysis?

A Yes.

Q And how did you consider those?

A Just in looking at how they might have impacted water quality in order to keep that in mind as we made the comparisons among them. 11:33AM

Q And how did you account for the differences?

A Not in any quantitative way, just sort of, say, well, how would these differences be important and does 11:33AM

that color the comparison in such a way as to make it invalid. 11:34AM

Q Well, how can the differences in depth have an impact on water quality during the summer months?

A They can have an impact in terms of how the epilimnion is set up in the lakes, how deep the epilimnion is, how much vertical mixing occurs between the epilimnion and hyperlimnion. There could be some impacts in terms of sedimentation in the different reservoirs. 11:34AM

Q If there is mixing, could that have an impact on the phosphorus in the epilimnion?

A Yes.

Q So it could increase -- if the reservoir is mixing during the summer it could increase the phosphorus in the epilimnion? 11:34AM

A Possibly.

Q Did you determine whether that was, in fact, occurring in Hugo and Sardis?

A No. 11:35AM

Q You didn't determine that one way or the other?

A No.

Q Do you know what the relationship is between mixing depths to reservoir area?

A Where? 11:35AM

the thermocline. I don't know if that's -- 11:38AM
Q No, sir?
A -- your definition.
Q I'm talking the mixing that occurs, for example, if you have a stratified lake during the fall, whether 11:38AM the temperatures in the lake reach more of an equilibrium so there's mixing from the bottom waters up to the top?
A Yes.
Q That's what I'm talking about. I'm talking about 11:38AM mixing that occurs where bottom waters are moved up to the top.
A Yes.
Q That kind of mixing.
A Yet. 11:38AM
Q And did you determine whether or not Hugo and Sardis mixing is similar to Tenkiller's mixing during the summer months?
A But during the summer months is when you would have the turnover. 11:38AM
Q Well, that's what my question is: Did you determine whether or not Hugo and Sardis turnover during the summer months, actually mix during the summer months?
A No. 11:38AM

Q Okay. Wouldn't that be important to determine whether or not there's additional phosphorus in the epilimnion available for algal growth? 11:38AM

A That could be, yes.

Q I'm going to hand you a series of BUMP reports. Do you know what the BUMP reports are, sir? 11:40AM

A Yes.

Q What are they?

A They're reports from a program that's called a Beneficial Use Monitoring Program that the State conducts to evaluate water quality throughout the state. 11:41AM

Q I've handed you Exhibit 17, which is the BUMP report for Tenkiller for 2001 through 2002. And then 18, which the BUMP report for Sardis for 2002-2003. And 19, which is the BUMP report for Hugo of 2002 to 2003? 11:41AM

A Mm-hmm.

MR. TODD: So, David, did you intend to say the first one was 2001 to 2002? 11:41AM

MR. PAGE: Yeah, I said it was. They didn't take -- they do these every five years and Tenkiller was on a little different annual basis, you probably noticed that yourself, than was Sardis, is that correct? 11:42AM

believe there's not -- there is the same amount of vertical mixing during the summer between Tenkiller and Sardis? Is that your testimony? 11:48AM

A My testimony is that based on the information we have, which as I indicate here is one day, that there's no evidence of differences in vertical stratification over the same depth intervals. 11:48AM

Q What about with regard to Hugo? Do you have the same opinion that there's -- that there's vertical stratification in Hugo similar to that at Tenkiller? 11:48AM

A For this time period, no, they're different. There is a much less vertical stratification in Hugo than we see in the profiles for Tenkiller or Sardis.

Q If that was consistent throughout the summer year in year out, would that indicate that Hugo and Tenkiller would have different water quality impacts due to that different stratification? 11:49AM

A There could be some differences associated with that difference.

Q Did you look at any of the other BUMP reports to determine whether there's a similar pattern in other years? 11:49AM

MR. TODD: Object to form. Asked and answered.

A Yes. 11:50AM

looking at average, it's probably somewhere between Lake 04 and Lake 03. 11:53AM

Q Okay. Did you limit your comparison of Lake Tenkiller with Hugo and Sardis to just the Lake 4 and Lake 3 region? 11:53AM

A No.

Q Why not if that's what the -- where the depths were the most similar?

A Because depth is not the only parameter we're looking at here. 11:54AM

Q But it is one that affects water quality, correct?

A It is one that can affect water quality.

Q So would it be more fair just to look at the similar depth areas in order to see whether or not Tenkiller and Hugo and Sardis have similar characteristics? 11:54AM

MR. TODD: Object to form.

A I don't think so but I would admit to being uncertain.

Q Okay. Look at Page 2-28, sir, 2-28 of your report, and if you can get out in front of you the second page of Exhibit 14 and I want to look at some of these chlorophyll-a numbers that we -- that you've discussed on Page 2-28. Would you read -- in the full paragraph there on Page 2-28, could you read the second 11:54AM 11:55AM